

Research Needs Statement

Title Feasibility study for the Georgia Department of Transportation to determine the economic and operational benefits of utilizing Unmanned Aerial Vehicles (UAVs).

Problem Statement Unmanned Aerial Vehicles (UAVs) are becoming more prominent in today's education and industrial environment. In February 2012 the US Congress mandated the Federal Aviation Administration (FAA) establish six (6) regional UAV test sites to collect UAV research and flight test data in order to develop policy and certification requirements for UAV integration into the National Airspace System (NAS) by 2015.

There are numerous issues with integrating unmanned aircraft into manned airspace. The current environment allows unmanned aircraft to only fly in very controlled or onerous circumstances which are determined on a case-by-case basis. It is important for FAA to collect as much relevant data as possible in order to develop policies for the integration of UAV into our national airspace system.

The State of Georgia is a vocal leader for the establishment of one of the six test sites to be located in the state. This opportunity will allow for exploration of the benefits and capabilities of UAVs for Department operations as it relates to safety, efficiency and capacity. This feasibility study will analyze the operations of each Division within the Department to determine the need for a UAV, the user requirements for the UAV and a cost benefit analysis to determine if UAV utilization is both operationally and economically viable. Data collection regarding existing and ongoing research for each UAV application will also be performed.

The ultimate goal of this study is to provide a starting point for the development and flight testing of a UAV(s) for Departmental applications as well as create an opportunity for Georgia to provide pertinent UAV data to the FAA to help guide policy decision making.

This endeavor will have a two-fold benefit.

1. Provide the Georgia Department of Transportation with a technology to advance the safety, efficiency and capacity of the state transportation system, and
2. Promote research and flight data collection for FAA to use in developing policies and certification requirements for UAV integration in the National Airspace

Literature Search

Limited research has been done regarding an in-depth study to determine the feasibility of UAV use in multiple divisions of state transportation departments.

However, there are many instances where UAV utilization research is being performed for transportation specific scenarios. For example, the Utah Department of Transportation is investigating the uses of UAV aerial photography for improving UDOT GIS databases with high resolution photographs of ongoing and recent highway construction (See *Evaluation and Development of Unmanned Aircraft (UAV) for DOT Needs*). The state of Washington has studied the capabilities of UAVs to use as an avalanche control tool, (see *The Use of Small Unmanned Aircraft by the Washington State Department of Transportation*) and the Florida Department of Transportation has researched the feasibility of using surveillance video from UAVs for traffic control and incident management (see *Airborne Traffic Surveillance Systems (ATSS) – Proof of Concept Study*).

Further research has been done outside state transportation departments exploring utilization of UAVs for certain types of transportation operations, such as traffic surveillance and monitoring (see AIAA technical paper *Lessons Learned: Application of Small UAV for Urban Highway Traffic Monitoring*).

These existing studies were developed to research individual needs of very specific situations and will be utilized in the information collection phase of this study; however there is little information available on the use of UAVs across all divisions of state transportation departments.

Research Objective

The preliminary goal of this study is to determine the potential uses for UAVs across all GDOT divisions, detail the user requirements and present a cost benefit analysis for each proposed UAV application. Some potential applications are:

- LIDAR scanning of existing pavement
- Inspection of bridge infrastructure
- Aerial photography
- Accident reporting and management
- Traffic monitoring
- Roadway inventory
- Emergency response management

A brief review of each GDOT Division's operation and mission will be performed with an in-depth analysis of those divisions and offices that have the potential to benefit from UAVs.

User requirements will be established for each identified division and/or office. In order to meet these requirements, UAV design characteristics will be developed, considering, but not limited to the following: primary and secondary mission definitions, UAV size, maneuverability, range, endurance, payload capacity and equipment needs.

Information from existing and ongoing UAV studies will be gathered for each proposed UAV application and will be included as part of this study.

Once the requirements and ultimate utility are fully determined, an estimated cost will be developed for UAV design and construction, maintenance, and operation. This cost will be evaluated against the potential for performance enhancement and cost savings to the Department and will be developed into a cost benefit analysis report. Each identified division or office will have its own cost benefit analysis report.

Implementation of the feasibility study will come with the next phase; design, development, research and testing the UAV(s) identified as benefits to the Department.

Research Significance

The completed feasibility study will give GDOT a platform for implementing UAV(s) to help accomplish the Department's goals in a more efficient and economical way. The study will weigh the cost versus the benefits for utilizing UAVs against the traditional methods currently in use.

The user requirements defined in this study will also allow for more rapid development of a test UAV if the Department decides to explore the applications further.

This study can also be a reference for other states in the nation to use for developing their own UAV applications.

Not only will this study promote advances within state and national surface transportation systems but provide a platform for research and flight testing data

collection for FAA to develop accurate UAV integration policies and certification requirements. Both surface and air transportation will be positively impacted by this endeavor.

Project Duration 1 year

Cost Estimate Not to Exceed \$75,000

Statement Developers Carol L. Comer, Director
Division of Intermodal
ccomer@dot.ga.gov
404.347.0573

Carla Sands, Acting Manager
Aviation Programs
csands@dot.ga.gov
404.505.4866

Investigator TBD
Agency

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GDOT Office Supporting Project Carol L. Comer, Director, Division of Intermodal
Carla Sands, Acting Manager, Aviation Programs

RTAG Technical Implementation Manager TBD

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